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Question Paper Code	13177
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B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Seventh Semester

Civil Engineering

20CEEL710 - TRANSPORT OF WATER AND WASTEWATER ENGINEERING

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

	<i>Marks</i>	<i>K- Level</i>	<i>CO</i>
1. Which of the following statements correctly describes the principle of continuity in fluid flow? (a) The total energy in a fluid system remains constant. (b) The mass flow rate of a fluid remains constant from one cross-section of a pipe to another. (c) The velocity of a fluid increases with increasing pipe diameter. (d) The pressure in a fluid decreases as the velocity increases.	1	K2	CO1
2. According to Bernoulli's equation, which of the following factors is NOT considered in determining the energy of a flowing fluid? (a) Kinetic energy per unit volume (b) Potential energy per unit volume (c) Viscous energy loss (d) Pressure energy per unit volume	1	K2	CO1
3. In a pipe flow system, which of the following factors contributes to minor head losses? (a) Changes in pipe diameter (b) Pipe length (c) Surface roughness of the pipe (d) Presence of fittings and bends	1	K2	CO1
4. Which property is MOST critical when selecting pipe materials for a water distribution system? (a) The pipe's ability to withstand internal pressure and external loads (b) The pipe's resistance to changes in temperature (c) The availability of the pipe material locally (d) The color of the pipe	1	K2	CO2
5. Which characteristic is MOST important to consider when selecting pumps in water transmission system? (a) The physical size and weight of the pump (b) The pump's efficiency and energy consumption (c) The pump's noise level during operation (d) The color and branding of the pump	1	K2	CO2
6. What is the primary objective of planning the transport of water and wastewater in civil engineering projects? (a) To enhance the aesthetic appearance of urban landscapes (b) To ensure the efficient and safe delivery of water and proper disposal of wastewater (c) To minimize the number of construction materials used (d) To reduce the overall project completion time	1	K2	CO2
7. What is the primary cause of water hammer in a pipeline system? (a) Sudden changes in fluid velocity due to rapid valve closure or pump shutdown. (b) High temperatures of the fluid being transported. (c) Excessive corrosion in the pipe material. (d) The presence of air pockets within the pipeline.	1	K2	CO3

8. Which method is commonly used for leak detection in water distribution systems? 1 K2 CO3
 (a) Visual inspection of above-ground pipes only
 (b) Acoustic monitoring technology to detect changes in sound patterns
 (c) Increasing the pressure in the entire system to identify weak points
 (d) Regular maintenance of storage reservoirs without any additional technology
9. Which of the following sewer appurtenances is specifically designed to mitigate the effects of corrosive wastewaters in a sewer system? 1 K2 CO3
 (a) Manholes (b) Corrosion-resistant piping materials
 (c) Catch basins (d) Cleanouts
10. Which of the following is a significant factor influencing the design of a sanitary sewer system? 1 K2 CO4
 (a) The anticipated rainfall and surface runoff in the area
 (b) The aesthetic appeal of the sewer access points
 (c) The age of the nearby infrastructure
 (d) The color of the pipe materials used
11. Which condition must be carefully considered when designing sewer outfalls to ensure effective mixing with receiving waters? 1 K2 CO4
 (a) The temperature of the wastewater
 (b) The pressure within the sewer system
 (c) The flow velocity of the effluent at the outfall
 (d) The type of pipe used for the outfall
12. What is a primary consideration when selecting pumps for wastewater pumping stations? 1 K2 CO4
 (a) The color and brand of the pump
 (b) The pump's efficiency and capability to handle solids in wastewater
 (c) The size of the pump's motor
 (d) The geographic location of the pump manufacturer
13. A combined sewer system is designed to 1 K2 CO5
 (a) Transport only stormwater.
 (b) Convey both sewage and stormwater in a single pipe.
 (c) Separate sewage and stormwater into different pipes.
 (d) Minimize the need for treatment facilities.
14. Rainfall intensity-duration-frequency (IDF) relationships are crucial for 1 K2 CO5
 (a) Understanding soil permeability.
 (b) Designing effective stormwater management systems.
 (c) Estimating evapotranspiration rates.
 (d) Evaluating groundwater recharge.
15. In a separate sewer system, stormwater runoff is typically 1 K2 CO5
 (a) Treated at a wastewater treatment plant.
 (b) Discharged directly into a nearby water body.
 (c) Diverted to a combined sewer system during heavy rainfall.
 (d) Stored in underground tanks for later use.
16. The Rational Method is commonly used for estimating stormwater runoff from 1 K2 CO5
 (a) Large urban areas with extensive drainage systems.
 (b) Small drainage basins or watersheds.
 (c) Coastal areas with tidal influences.
 (d) Industrial sites with significant impervious surfaces.
17. EPANET 2.0 is primarily used for 1 K2 CO6
 (a) Estimating stormwater runoff in urban areas.
 (b) Modeling the hydraulic and water quality behavior of water distribution systems.
 (c) Designing structural components of wastewater treatment plants.
 (d) Conducting land use planning and zoning.

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| 18. LOOP version 4.0 is known for its capabilities in | 1 | K2 | CO6 |
| (a) Providing detailed geological analysis for construction sites. | | | |
| (b) Performing optimization of water distribution networks. | | | |
| (c) Estimating the ecological impact of water bodies. | | | |
| (d) Designing aesthetic landscaping for public parks. | | | |
| 19. The SEWER software is specifically designed for | 1 | K2 | CO6 |
| (a) Managing agricultural irrigation systems. | | | |
| (b) Analyzing the performance of sewer systems and wastewater collection. | | | |
| (c) Simulating stormwater drainage in urban areas. | | | |
| (d) Creating CAD drawings for civil engineering projects. | | | |
| 20. GIS-based software in water and sewer design is primarily utilized for | 1 | K2 | CO6 |
| (a) Enhancing the aesthetic design of water treatment facilities. | | | |
| (b) Analyzing spatial data for planning and managing water resources. | | | |
| (c) Conducting structural analysis of pipelines. | | | |
| (d) Predicting weather patterns affecting water supply. | | | |

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

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| 21. State the principal of conservation of energy. | 2 | K1 | CO1 |
| 22. What is meant by minor head losses? | 2 | K1 | CO1 |
| 23. What are the key properties to be consider when selecting pipe materials? | 2 | K1 | CO2 |
| 24. What are pump characteristics curves? | 2 | K1 | CO2 |
| 25. How to avoid water hammer effect? | 2 | K2 | CO3 |
| 26. What do sewer appurtenances refer to? | 2 | K1 | CO3 |
| 27. Define optimization in network analysis. | 2 | K1 | CO4 |
| 28. Why are the sanitary sewers designed for partial flow? | 2 | K2 | CO4 |
| 29. Mention the rational method of estimating storm water drainage. | 2 | K1 | CO5 |
| 30. What is the purpose of EPANET? | 2 | K1 | CO6 |

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

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| 31. a) Explain the fluid flow measurement principles in closed conduits. | 10 | K2 | CO1 |
| OR | | | |
| b) Explain the different methods to measure flow in free and pressure flow conditions. | 10 | K2 | CO1 |
| 32. a) Describe the components in water transmission main design and distribution. | 10 | K2 | CO2 |
| OR | | | |
| b) Explain the need for transport of water and wastewater planning. | 10 | K2 | CO2 |
| 33. a) Explain laying and jointing procedure and maintenance in water transmission line. | 10 | K2 | CO3 |
| OR | | | |
| b) Explain in detail about the conveyance of corrosive wastewaters. | 10 | K2 | CO3 |
| 34. a) How would you apply the key factors in the selection of wastewater pumps and pumping stations to ensure efficient system performance, considering aspects such as flow rate, pump efficiency, system reliability, and environmental regulations? | 10 | K3 | CO4 |

OR

b) A 120 m reach of sewer is to be designed with the flow capacity of 100 L/s. The street elevation at the upper man hole is 90.00 m and the lower manhole is 87.60 m. Determine an appropriate pipe diameter and slope for this reach, and established pipe invert elevations at the upper and lower manholes. Assume a minimum earth cover of 2 m above the crown of the pipe. 10 K3 CO4

35. a) Explain the rational method of storm flow estimation and list the associated assumptions. 10 K2 CO5

OR

b) Explain the importance of formulation of rainfall intensity duration and frequency relation. 10 K2 CO5

36. a) Evaluate the uses of computer software in the management of water transmission and distribution systems. 10 K3 CO6

OR

b) Identify the salient features of GIS based software for design of water distribution and sewer system. 10 K3 CO6